Title: Loss verification of Li-ion battery cell using electrical characterizations as well as direct thermal flow measurements

Background: Applications of Battery Electric Vehicles (BEVs) are increasing rapidly. Li-ion batteries (LIBs) are one of the crucial and key components for BEVs. Therefore, it is very important for Volvo group to have a deeper understanding of LIBs, especially cells’ behavior, performance, lifetime etc from a heavy duty automotive perspective. Aging of the LIB cells is a complex phenomenon and understanding its mechanism is difficult to know only from full cell measurement. Sometimes it is necessary to reconstruct the cell to separate the aging phenomenon on different parts of the cell. Heat dissipation is an indicative parameter to understand the losses in LIBs. Therefore, the heat loss of the full cell or part of the cell will be measured in an isothermal conductive calorimeter.

Scope: To build a pouch cell, characterize its electrical performance and verify losses both electrical as well as thermally. The period is one semester, 30 ECTS with preferable start January 2023.

The thesis should include:

- Study possible and available anode and cathode materials.
- Construct pouch cells with 1 and several layers, focusing on achieving the highest possible capacity.
- Update an existing calorimeter to be able to sense very low thermal flows.
- Design for and measure on available 0.8 Ah 4×5 cm specially built cells.
- Characterize all cells electrically, compare with the theoretical assumptions and check with thermal measurements.

Student Profile: This thesis is suitable for one engineering student with educational background within the field of Material Science, Electrical Engineering, Chemical engineering, Physics and/or Chemistry. The thesis works requires programming knowledge in Python/Matlab for data analysis or model development. Understanding the physical, electrochemical, or aging aspects of the Li-ion cell is a merit.

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